DETERMINATION OF WHEY PROTEINS IN MILK SAMPLES

INTRODUCTION
One of the tests for authenticity of milk and dairy foods is the qualitative and quantitative composition of whey proteins and their ratio. Caseins dominate in cow’s milk before its processing (about 80% of total protein), whereas caseins are almost absent in the whey composition whose main components are the following:
- β-lactoglobulins,
- α-lactalbumin,
- bovine serum albumin,
- immunoglobulins,
- lactoferrin and other minor proteins.
It is known that the protein composition in heat treated (pasteurized or sterilized) milk substantially differs from that in raw milk. Of the two basic whey proteins it is β-lactoglobulin that is least resistant to heating. It has been ascertained that its content in powdered milk is small and decreases during long storage.

MEASUREMENT METHOD
The method developed by Lumex researchers is intended for measuring weight concentration of proteins in whey using capillary electrophoresis (CE) technique. The obtained measurement results provide solutions of the following application tasks:
- record the whey protein pattern of cow’s milk;
- reveal the presence of reconstituted milk in whole pasteurized milk;
- identify milk origin from various dairy cattle.

MEASUREMENT RANGE
The measurement ranges of the weight concentrations of proteins in whey are listed in table below.

<table>
<thead>
<tr>
<th>Component</th>
<th>Measurement range, g/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>α-lactalbumin (α-LA)</td>
<td>0.01–100</td>
</tr>
<tr>
<td>β-lactoglobulin A (β-LG A)</td>
<td>0.02–10</td>
</tr>
<tr>
<td>β-lactoglobulin B (β-LG B)</td>
<td>0.02–10</td>
</tr>
</tbody>
</table>

ADVANTAGES OF THE CE TECHNIQUE
As compared to chromatographic technique for determination of whey proteins, the CE technique shows the following advantages:
- short time of analysis;
- no need for costly chromatography columns (fused silica capillaries tens of times less expensive than specific HPLC columns are used in measurements);
- capability of determination of various β-lactoglobulin isoforms.

EQUIPMENT AND REAGENTS
The following equipment and reagents are used in the measurements:
- CAPEL®-105M capillary electrophoresis system;
- α-lactalbumin, β-lactoglobulin A, β-lactoglobulin B, bovine serum albumin;
- sodium hydroxide, reagent grade;
- hydrochloric acid, high purity grade;
- boric acid, reagent grade;
- Tween®20.

Data acquisition, processing and output are performed using a personal computer running under WINDOWS® XP/Vista/7 operating system with installed dedicated software for data acquisition and processing.
EXAMPLES OF REAL ANALYSES

SEPARATION CONDITIONS:
Buffer: borate with Twee® 20 additive
Capillary: L_{eff}/L_{total} 40/50 cm, I.D. 50 μm
Sample injection: 250 mbar·s
Voltage: +25 kV
Detection: 205 nm

Whey protein pattern of pasteurized milk

Measurement results (g/l):
1 – α-LA (1.9)
2 – β-LG B (1.1)
3 – β-LG A (1.5)

Whey protein pattern of dried milk

The contents of this paper are subject to change without notice.
The information in this leaflet is supplemental. To get more specific information on this method, please contact the developer of this method Lumex Instruments Ltd.

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